Lab # 5

**DotMatrix Display**

**Graphical LCD**

Objectives

- To be familiar with LED Dot-Matrix display.
- To be familiar with Graphical LCD displays.

LED Dot Matrix Display

A dot matrix is a 2-dimensional array of dots used to represent characters, symbols and images. Typically the dot matrix is used in many digital display devices. In displays, the dots light up, as in an LED or CRT display. Led matrix display can show pictures and words, and RGB led matrix even can show video.

LED matrix has the size from 0.7" to 4.6". According to its dot arrangements, LED dot matrix display also can be divided into 5*7 dot matrix, 5*8 dot matrix and 8*8 dot matrix. Actually there are also led matrix consists of led lamps.
Internal connection of the Dot-matrix display illustrates its idea of work. Note that every LED is simply a diode that lights when you put it in a circuit with a drop voltage. So using MCU we are going to loop over every column and supply the right voltage and ground values.

To write 5 this how it really looks:
Lab Work 1

- Use the following constant to display numbers on DotMatrix.

```c
const font as byte[215] = (
    $7E,$11,$11,$11,$7E,  'A
    $7F,$49,$49,$49,$36,  'B
    $3E,$41,$41,$41,$22,  'C
    $7F,$41,$41,$22,$1C,  'D
    $7F,$49,$49,$49,$41,  'E
    $7F,$09,$09,$09,$01,  'F
    $3E,$41,$49,$49,$7A,  'G
    $7F,$08,$08,$08,$7F,  'H
    $00,$41,$7F,$41,$00,  'I
    $20,$40,$49,$49,$7A,  'J
    $7F,$08,$14,$22,$41,  'K
    $7F,$40,$40,$40,$40,  'L
    $7F,$02,$0C,$02,$7F,  'M
    $7F,$04,$08,$10,$7F,  'N
    $3E,$41,$41,$41,$3E,  'O
    $7F,$09,$09,$09,$06,  'P
    $3E,$41,$51,$21,$5E,  'Q
    $7F,$09,$19,$29,$46,  'R
    $46,$49,$49,$49,$31,  'S
    $01,$01,$7F,$01,$01,  'T
    $3F,$40,$40,$40,$3F,  'U
    $1F,$20,$40,$20,$1F,  'V
    $3F,$40,$38,$40,$3F,  'W
    $63,$14,$08,$14,$63,  'X
    $07,$08,$70,$08,$07,  'Y
    $61,$51,$49,$45,$43,  'Z
    $3E,$51,$49,$45,$3E,  '0
    $00,$42,$7F,$40,$00,  '1
    $42,$61,$51,$49,$46,  '2
    $21,$41,$45,$4B,$31,  '3
    $18,$14,$12,$7F,$10,  '4
    $27,$45,$45,$45,$39,  '5
    $3C,$4A,$49,$49,$30,  '6
    $01,$71,$09,$05,$03,  '7
    $36,$49,$49,$49,$36,  '8
    $06,$49,$49,$49,$3E,  '9
    $00,$00,$00,$00,$00,  '
    $08,$08,$3E,$08,$08,  '+'
    $08,$08,$08,$08,$08,  '-'
    $00,$60,$60,$00,$00,  '<'
    $14,$08,$3E,$08,$14,  '*'
    $00,$36,$36,$00,$00  ':'
)
```
- Simulate your work on Proteus.
- Program the MCU and connect the circuit.
- **Save your code and a snapshot of your Proteus connection. (this must be included in your report!)**

Graphical LCD

Graphical LCDs allow creating more elaborate visual messages than usual alphanumerical (character) LCDs can provide, involving drawings and bitmaps.

Controllers

The most important consideration in choosing an LCD display is the controller. An LCD display without a controller needs to be refreshed at a fast enough rate to prevent flickering. The most popular, though slightly outdated standard is the T6963C controller made by Toshiba. Another popular choice is the SED series made by Epson.

Size

LCD graphics displays come in a variety of sizes, ranging from 32 x 80 to 240 x 320. Larger displays offer more display area, cost more, and take longer to refresh the entire screen with new data.

In this lab we will work with PG128128A LCD (128 * 128) that have T6963C controller. Use mikrobasic T6963C Graphic LCD Library to program such LCDs.
Lab Work 2

Explore T6963C Graphic LCD Library basic functions and then print your name inside a rectangle:

- T6963C_Init
- T6963C_write_text
- T6963C_line
- T6963C_rectangle
- T6963C_circle
- T6963C_image
- T6963C_graphics
- T6963C_text
- T6963C_grFill

- Simulate your work on Proteus.

Help : the connection is like this :

T6963C_init(128, 128, 8, PORTb, PORTd, 0, 1, 2,3)
To draw an image on this type of graphic LCD use the following procedure

1. Get an image with the same size of your LCD in pixels exactly.
2. Convert this image to a monochrome image (black & white) using any painting program and save it with bmp format.
3. Use Mikrobasic tool GLCD bitmap editor from tools menu.
4. From t6963c tab choose the appropriate value for GLCD size/ controller according to your LCD size.
5. Load the bmp picture form load button an automated code will be generated for this picture.
6. Choose mikrobasic code from the bottom right list.
7. Copy the generated mikrobasic code to clipboard and paste it into your program, or paste it into a module file then include this module in your program.
Lab Work 3

Draw your own image

- Simulate your work on Proteus.
- **Save your code and a snapshot of your Proteus connection. (this must be included in your report!)**

HomeWork

- Include all your work during the lab.
- A hard-copy of reports should be submitted next meeting.